proportion of hydrogen, methane, and acetylene; and collecting a residual hydrogen-rich gas;

b) at least partially evaporating, by a reduction in pressure, the second, ethylene- and ethane-enriched condensate and the first, propylene-enriched, condensate, and heating, in at least one of said successive heat-exchange zones, by thermal exchange with fluids to be cooled, including at least the gas resulting from pyrolysis, to provide, respectively, a first fraction at least partly evaporated due to the reduction in pressure and the heating of the ethylene- and ethane-enriched condensate, and a second fraction at least partly evaporated due to the reduction of pressure and the heating of the propylene-enriched condensate, to provide at least part of the cooling necessary for the cooling and liquefying of the gas resulting from hydrocarbon pyrolysis upon passage into the successive heat-exchange zones successively;

c) introducing the at least partly evaporated first and second fractions resulting from stage (b) into a part of a distillation column called a de-ethanizer, the ethylene- and ethane-rich first fraction which is at least partly evaporated, at a point of said distillation column higher than a point of introduction of the partly evaporated propylene-rich fraction after the partial evaporation, the part of the distillation column operating under conditions of temperature and pressure for separation, in an upper part, of a first head gas current rich in ethylene and ethane and containing, in a smaller proportion, acetylene, hydrogen, and methane, and in a lower part, a first bottom liquid current enriched with propylene, and collecting the first bottom liquid current;

d) sending the first head gas current from stage (c) into an acetylene elimination zone eliminating acetylene by one of extraction with a solvent and selective hydrogenation of acetylene with the hydrogen contained in the first head gas current to provide a current essentially free of acetylene, and

e) cooling and fractionating, in a part of a distillation column called the de-methanizer, the current essentially free of acetylene to produce a second head gas fraction enriched with one of hydrogen and methane, collecting the second head gas fraction, and a second bottom liquid fraction, enriched with ethylene and ethane, and essentially free of acetylene, and collecting the second bottom liquid fraction.

2. The process according to claim 1, wherein the gas from hydrocarbon pyrolysis is at a pressure of 15–50 bar, and the distillation column is at a pressure of 10–30 bar and, lower than the pressure of the pyrolysis gas.

3. The process according to claim 1, wherein the evaporated fractions introduced into the de-ethanizer contain dissolved hydrogen in a proportion so that the first head gas current contains 2–10%, in moles, of hydrogen, and, in stage (d), the selective hydrogenation is essentially in ethylene with the hydrogen contained in the first head gas current of stage (c), and the temperature at the hydrogenation ranges from 0° C. and 160° C.

4. The process according to claim 1, including using only hydrogen dissolved in the evaporated fractions introduced into the part of the distillation column called the de-ethanizer for the hydrogenation in stage (d).

5. The process according to claim 1, including obtaining at least two condensates after successive passage of the gas resulting from pyrolysis, respectively, into at least two heat-exchange zones of stage (a) and sending into an upper part of the de-ethanizer of stage (c).

6. The process according to claim 1, including purifying the second head gas fraction exiting the de-methanizer by distillation to recover ethylene and ethane.

7. The process according to claim 1, wherein the gas resulting from pyrolysis is a gas from pyrolysis of one of ethane and an ethane/propane mixture, and including mixing the second head gas fraction exiting the de-methanizer with the gas resulting from pyrolysis without ethylene recovery, for treatment in mixture with the gas resulting from pyrolysis in stage (a).

8. The process according to claim 1, including increasing hydrogen content of the first head gas current exiting the de-ethanizer by addition of hydrogen from a separator, separating a partly condensed fluid produced by refrigeration, in a heat-exchange zone, of a residual gaseous fluid flowing from the successive heat-exchange zones.

9. The process according to claim 1, including recycling part of the second liquid bottom fraction from the de-methanizer into the de-ethanizer, to reduce acetylene concentration of the first head gas current from the de-ethanizer.

10. The process according to claim 1, including, in stage (d), extracting acetylene with a solvent.

11. The process according to claim 1, wherein the first head gas current includes carbon monoxide in a concentration moderating effect on reaction catalysis in the acetylene elimination zone.

12. An apparatus for fractionation of a gas resulting from pyrolysis of hydrocarbons containing hydrogen and hydrocarbons, including ethylene, propylene, and acetylene, in at least one of a hydrogen and a methane-rich current, at least one of an ethylene-rich and acetylene poor current, and at least one propylene-rich current, the apparatus including:

a) means for progressively cooling and liquefying the gas from the pyrolysis of hydrocarbons, under pressure, by passage into a series of increasingly colder successive heat-exchange zones, means for separating from the pyrolysis gas at least one condensate after passage into each heat-exchange zone, a first of the condensates being propylene-enriched and a second of the condensate being ethylene- and ethane-enriched and containing, in solution, a smaller proportion of hydrogen, methane, and acetylene, and means for collecting a residual hydrogen-rich gas;

b) means for evaporating, at least in part, by a reduction of pressure, the second, ethylene- and ethane-enriched condensate and the first, propylene-enriched condensate and means for heating the condensates, independently, in at least one of the successive heat-exchange zones by thermal exchange with fluids to be cooled, to provide, respectively, a first fraction at least partly evaporated, resulting from the reduction of pressure, and means for heating the ethylene- and ethane-enriched condensate, and a second fraction at least partly evaporated, resulting from the reduction of pressure and the heating of the propylene-enriched condensate, to provide for progressive cooling and liquefaction of at least the gas from the-pyrolysis of hydrocarbons upon successive passage through the successive heat-exchange zones;

c) means for introducing the partially evaporated first and second fractions from (b) into a part of a distillation column called a de-ethanizer, the ethylene- and ethane-enriched partly evaporated first fraction being admitted at a point of the part of the distillation column higher

than a point of introduction of the propylene-rich partly evaporated second fraction, the part of the distillation column operating under conditions of temperature and pressure for separating, in an upper part, a first ethylene- and ethane-rich head gas current containing, in a smaller proportion, acetylene, hydrogen, and methane, and, in a lower part, a propylene-rich first bottom liquid current, which is collected;

d) means for sending the first ethylene- and ethane-rich head gas current from (c) into an acetylene elimination zone for elimination of acetylene by one of extraction with a solvent and selective hydrogenation of acetylene with hydrogen contained in the first head gas current, to provide a current essentially free of acetylene, and

e) means for cooling and fractionating, in a part of a distillation column called a de-methanizer, the gas current essentially free of acetylene from (d), in a second hydrogen-and/or methane-enriched head gas fraction, which is collected, and a second bottom liquid fraction which is enriched with ethylene and ethane and is essentially free of acetylene, and which is also collected.

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